3:Kemeny G-5 (1945-48)195) EC1 Hungary EC1

185 Plan may have assumed something of that character. But at the start the outlook was different. At any rate, after a period of privation, a serious effort had to be made to raise the standard of living, if only as a means of attaining higher efficiency. Moreover, an austerity programme, concentrating on the extension of heavy industry as its primary objective, did not fit into the political atmosphere of that initial period.

Extension in the whole field of industry strained domestic financial resources to the utmost. The redistribution of incomes and of consumption might to a moderate extent have contributed to the solution of the problem. But the solution had to be found mainly in increase of national income through enlargement of production. This call for higher production of consumer goods as well as of capital goods called in its turn for industrialization, both in the sense of expanding industry and in that of mechanizing agriculture.

464 By placing industrialization in the centre of economic policy a familiar chord was struck. It was, in fact, an axiom in Hungary in the inter-war period that only industrial expansion could solve the most urgent problem of the country, the employment of the agricultural surplus population. This question became acute after the outlet, which had been open before the First World War by way of mass emigration to the United States, had been blocked. The main conditions for industrial development were present. There was a reserve of working population more than sufficient in numbers and able to adapt themselves to the conditions of industrial work. Skilled labour was in high demand, as shown by a larger margin between the wages of skilled and untrained men than is usually experienced in the Western countries. So long as the progress of industrialization was no more than gradual, this gap could be partly filled by the attraction of foremen from abroad. Nor was technical and managerial skill wanting.

● 135 439 [312] Of natural resources essential for industry a great part had to be imported. Coal deposits, composed largely of brown coal, are moderate compared with those of most of the industrial countries. Water-power potential is small. Ample in supply are bauxite, natural gas, and, in a lesser degree, mineral oil. High-quality coal has had to be imported to meet the requirements of metallurgy, but otherwise coal-mining has supplied industry with the quantity wanted.[1]

[1] Output 1938: roughly 9,000,000 tons; imports: 500,000 tons. Some 10 per cent of the whole output was bituminous coal of the calorific value of 12,000–13,500 British Thermal Units (compared with 14,000–16,000 B.T.U. of British bituminous coal). Otherwise brown coal was mined mostly of a calorific value of 7,000–11,000

3:Kemeny G-5 (1945-48)1952 EC1 Hungary EC1

Cheap labour and scarce capital supplies directed industrialization towards the expansion of textile and other light industries. On the whole this line, typical for the industrialization of countries with the economic structure of Hungary, was followed during the inter-war period.

However, outside the general trend in the inter-war period there were some disturbing factors. The drive for industrialization gained a further impetus through the deterioration of the terms of trade as a result of increasing difficulties in disposing of the agricultural surplus at prices covering cost. This was due to the adverse tendency of the world market, but was aggravated by the protective measures taken by Germany, and other important consumers of Hungarian farm products, in their endeavours to approach self-sufficiency. In this atmosphere of economic nationalism the governing consideration in deciding on industrial investment projects was whether the requirements of the domestic market were or were not met by home supplies of the products concerned. The idea of 'improving' the trade balance by reducing imports of manufactured goods was gaining favour, and due consideration was not given to the broader aspects of international trade and to possibly more economic uses of resources.

A similar spirit has apparently become the guiding principle of the planners who are for the time being responsible for industrialization in South-eastern Europe. They are likely to be even more devoted to an economic philosophy inspired by nationalism than those who directed economic policy under capitalism. The present champions of industrial development blame their capitalist predecessors for having omitted to build up an adequate machine-tool and engineering industry. Preference for light industry had, it is contended, sacrificed the independence of the Hungarian economy in serving Western capitalist interests. The outstanding feature of economic policy, as professed at present, is the drive for an all-round industrial development with emphasis on heavy industry.

Thus the claim for autarky is being put forward more strongly than ever before. The insistence with which the case of heavy industry is advocated justifies the suspicion that it is supported by considerations other than purely economic. In the eyes of Communist politicians independence of the West in sectors of

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B.T.U. Only a small part of this portion of coal production was low-grade lignite (3,500–4,500 B.T.U.) used locally, and, on an increasing scale, to produce thermal electric power. Brown coal of average quality was generally used as fuel for manufacturing industry, railways, and agriculture. As shown by experience during the war, production could be considerably raised above the 1938 level.

THE OIL INDUSTRY IN THE HUNGARIAN ECONOMY

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from Romania (1890-1916). These imports gradually declined in importance as Austrian (Galician) and, to a lesser degree, Hungarian, crude oil production developed.

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Oil exploration until 1894 was on a small scale and was mainly of a local nature. Since no commercial deposits were discovered, from 1894 to 1907 the government granted small subsidies to encourage further exploration. In 1907 the government began to undertake its own exploration (geological surveying) and Section 6 of the Law of 1911 declared all natural hydrocarbons a state monopoly. Subsequently, numerous concessions were granted to Hungarian as well as foreign companies under this law.

Natural gas, which had found considerable industrial utilization by the end of World War I, was discovered in Transylvania in 1909.

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On the over-all economic scene World War I brought about a great upswing in industrial activities and some controls. During the artificial boom created by the war all basic industries were expanded greatly.

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The Treaty of Trianon, 1920, brought complete separation from Austria; it also brought the loss of more than two-thirds of Hungary's land area and some three-fifths of her population. The Dual Monarchy's tariff-free market of fifty million people was reduced to a market of little more than eight million. The lost territories included all the regions where oil and gas prospecting had taken place. Slovakia and Ruthenia in the north went to Czechoslovakia; Croatia, Bachka, and the Mura district in the south were incorporated into Yugoslavia; while Romania obtained Transylvania and adjacent areas in the east.

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The dislocations caused by the war, by the ensuing disturbances, and by the enormous loss of territory brought the whole Hungarian economy to the verge of chaos.

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In 1924 the government adopted a policy of high tariff protection for industry by which Hungary, like her neighbors, aimed at self-sufficiency.

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The following year[1] oil was discovered in Transdanubia and by 1941 Hungary had completed the transition from an oil importing to an oil exporting nation. The relevant data for these important transition years are found in Table VIII.[2]

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There are no precise export-import data available for the chaotic years 1944 and 1945, when Hungary was a battlefield and the oil fields were under first German then Red Army supervision. It is known, however, that crude production in 1944 amounted to 810,000 tons of which some 500,000 tons were exported to Germany or were used up by the German Army in Hungary. Similarly, of the 1945 production of 656,000 tons the Germans took about 100,000 tons while the Red Army seized over 400,000 tons.

Oil exports played a major part in Hungary's reviving postwar foreign trade. In contrast to the war years, when the bulk of the Hungarian oil was shipped westward to Germany, the postwar exports went east to the Soviet Union, with smaller quantities being taken by Yugoslavia, Czechoslovakia, and Poland. Exports amounted to 340,000 tons in 1946 and to 251,500 tons in 1947. Of these 135,000 tons and 25,000 tons respectively were on the war reparations account.

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Beginning in September 1948 statistical secrecy was imposed on export-import figures by the communist government. Despite the complete lack of any official information it has been possible to estimate the "exportable surplus" of oil for the five years following 1947. This method involves the determination of the domestic crude production and the calculation of the domestic consumption from such secondary information as the number of trucks and cars, the level of industrial activity, and other contributing factors. By subtracting the domestic consumption from the domestic production we obtain the "exportable surplus" quantities. It must be remembered, of course, that these data, however carefully arrived at by calculations and estimations, are approximations and are used here only due to the lack of more accurate information.

1 [i.e. in 1937 - Analyst][18]

2 [See page 87 - Analyst]

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EXPLORATIONS AND DISCOVERIES

BEFORE 1920

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While the development of Hungary's oil industry has been greatly influenced by the political and economic developments of the last century, its very existence was determined by geologic events which occurred millions of years earlier.

Most of the area under study was dry land during the Mesozoic era, and considerable erosion took place; accordingly, oil accumulations are to be expected mainly in the abundant Tertiary formations. In the early Tertiary period the area began to sink.[1] The sinking, however, was not uniform. Some parts of the former mountain systems remained in relatively higher positions, and to the badly eroded remains of the older mountains new ones were added, formed by Tertiary volcanism. Several basins developed as a consequence of the volcanism and of the uneven sinking (which recent surveys indicate is still occurring).[2] Transgression followed the sinking, and the basins were gradually filled with Tertiary sediments, which in some places reached over ten thousand feet of thickness.[3]

The largest of the basins thus formed is the Great Hungarian Basin, which coincides with the Great Hungarian Plain. It includes most of presentday eastern Hungary, the Yugoslav province of Vojvodina and narrow strips along Romania's western and Carpatho-Ukraine's southern boundaries. The two other major basins are the Győr Basin to the northwest (divided about equally between Hungary and Czechoslovakia) and the Transylvanian Basin to the southeast (part of Romania).

1 [cf. cat. nr, p. 51 for footnote -- Analyst]

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The northeast-southwest trend of the Bakony Mountains and the Vértes and Pilis mountains separates the Györ Basin from the Great Hungarian Basin. The Györ Basin is bordered to the west and northwest by hills along the Austrian border (which include outcroppings of the submerged northeast extension of the Alps) and by the Lajta Mountains and the Little Carpathian Mountains.

Beyond the Little Carpathians is the Vienna Basin, straddling the Czechoslovak-Austrian border.

The Transylvanian Basin is limited to the east and south by the Carpathian Mountains and to the north and west by a chain of the remains of the pre-Tertiary mountain system and Tertiary volcanic hills, forming a quadrant of a circle.

Finally, a minor area having some oil-geological interest is the valley of the Iza River in northeast Romania

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Exploration and exploitation before 1880, though primitive and inefficient, established the existence of oil in many parts of Hungary, and furnished leads for later explorations.

For centuries Hungarians had been aware of oil occurrences in some regions of their land. Before the recent era of intensive exploration, oil was found in the Flysch zone in the northeast in Ung and Maramures (Máramaros) counties (see Uzhorod [Ungvár]) and the Iza River Valley.[1] Oil traces were found in the southeast corner of Transylvania in the same geological formation at Sósmezo. Asphalt-impregnated Pontian (Pliocene) sandstones occurred at Derna and Tătăraş (Tatáros), east of Oradea (Nagyvárad). Oil was found at Recsk on the northern margin of the Great Hungarian Plain, and there was a minor occurrence at Jibău (Zsibó), between the Transylvanian and Great Hungarian basins.

The earliest explorations were made in the southwest region, now part of Yugoslavia, where oil was known to occur at Selnice (Szelencze) and Peklenica (Bányavár)

1 [For footnote, cf. cat. 116, p. 51 -- Analyst]

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in the Medjumurje (Muraköz) area, and south of the Drava River at Ludbreg, at Pogancec, and at Pitomaca; and at Ivanic and Mikleuska and Bujavica and Peklenica. Peklenica and Mikleuska were prospected around 1850.

In 1860 a plant at Anina in Transylvania began distilling oil from bituminous shales. A second plant was added in 1867, and production reached 900 to 1,000 tons of crude oil a year, distilled from 15,000 to 20,000 tons of shale. These plants were abandoned in 1882. Similar plants distilled oil and asphalt from the above-mentioned tar sands at Derna and Tătăraş. These sands contained 11 to 15 percent tar, which was washed out of the sand and then distilled. By 1906 these plants had produced 25,300 tons of oil and 45,400 tons of asphalt. The annual rate thereafter was 2,000 to 2,500 tons of oil and 4,000 to 5,000 tons of asphalt.

From 1881 to 1893 many shafts were sunk and many wells drilled near surface oil occurrences. Some shafts were 300 feet deep, and one reached 1,800 feet, but none tapped commercial oil pools.

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To encourage continued exploitations in the face of these failures, the Hungarian government began in 1894 to subsidize the search for oil. By 1903, seventy thousand dollars of public funds thus invested resulted in oil production from two small pools, the first discovered at Selnice and the second at Peklenica. These small strikes called attention to the Medjumurje area, however, and a delayed return on the public investment came in the form of important oil fields later discovered on the same geological trend.

In 1907 the government ceased to subsidize private operations and began to undertake its own explorations.

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Until 1911 oil resources were open to private exploitation, subject to government regulation. The same was true of natural gas.[2] But Section VI, 1911, of the Hungarian law declared a state monopoly on natural hydrocarbons: bitumen, oil, gas, tar, asphalt, and ozocerit. The law

2 [for footnote, cf. Cat. 116, pp. 51-52--Analyst]

EXPLORATIONS AND DISCOVERIES

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The oil is heavy, with an asphalt base. Its gravity is 21.0° API.[8] It contains no gasoline but furnishes an excellent, high viscosity lubricating oil. Fractional distillation shows: 3.5 percent (29.7° API) distilled between 150° and 200° C.; 28.5 percent (26.4° API) between 250° and 300° C. residuum, 67.5 percent (17.0° API); asphalt content, 0.37 percent; sulphur, 0.25 percent; paraffin, none.[9]

In spite of further exploration, no additional commercial quantities of oil were found in this vicinity.

At Hodonín, north of Gbely in the Vienna Basin, is Czechoslovakia's most productive oil field. Its domes contain five oil horizons. Three are Sarmatian (Miocene); oil from the upper two is similar to Gbely oil: heavy, without gasoline and with an asphalt base. Oil from the third horizon is similar but lighter and contains some gasoline. Oil from the fourth horizon, Mediterranean (Miocene), is very much lighter; and an extremely light oil, with high gasoline content and paraffin base, comes from the fifth horizon, at about 4,900 feet in Carpathian sandstones (Flysch).

The Hodonin structures are strongly faulted. Some faults have considerable throw, and the oil produced from the Sarmatian at the downthrown side of the fault is much lighter than the oil produced at the upthrown side of the fault from a shallower depth. It contains gasoline and has a paraffin base—although it is generally believed that asphalt-based and paraffin-based oils are of differing origins.

South of Gbely, an oil discovery was reported in 1950 near Malacky. This could not, as Russian authorities have claimed,[10] be an extension of the Austrian Zistersdorf field, as the general geological strike there is north-northeast to south-southwest. If this discovery is actually a commercial oil field it is probably a dome similar to the Gbely domes.

[8] [for footnote, cf. cat. 116, p. 52 - - Analyst]

315 bered that this was before the confiscation of MAORT.

It appears that in the hope for quick success Maszovol drilled its first exploratory wells on the prospects outlined by the German exploration. The fifth well on the Körösszegapáti structure started by the Germans was completed by Maszovol as a gas well. Two more holes were drilled on this structure, but no commercial oil production was obtained.

Maszovol also drilled two or three wells on the Biharnagybajom prospect previously mapped by MANAT. The first well produced salt water with a negligible amount of oil at 3,300 feet from probably Miocene formations. The other wells were also failures. As soon as the oil traces in the first Biharnagybajom well were reported it was propagandized as a "big new discovery" and the news was spread through the world press. No other news was released about the Maszovol activities. It seems safe to state that no important discovery has yet been made within the Maszovol territory.

Northeastern Hungary

The Hungarian government has conducted an intensive postwar exploration campaign in the area east of the Danube and north of the Maszovol concession, especially along the northern margin of the Great Hungarian Plain.

According to one report widely quoted by Western oil publications: "Additional oil structures were found between Eger and Gyöngyös, along the Mátra Mountains; however, drilling-equipment shortage prevented more than two wells being completed in 1951...each producing slightly more than 38 barrels daily."[6] [135]

Another unconfirmed report states that a new oil field has been discovered near Mezötúr, about 20 miles east-southeast of Szolnok.[7] Presumably a test well was drilled on the gravity maximum discovered north of Mezötúr by prewar surveys of the Eötvös Geophysical Institute. A few months later this Mezötúr "field" was reportedly turned over to Maszovol for exploitation.

Rumors persist of an important strike near Mezökeresztes in Borsod-Gömor County. According to reports, the extensive surveying of the area by the Eötvös

[OA. cat. 116, p. 73 for source -- Analyst]

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Geophysical Institute under the direction of Professor Elemér Vadász and under the supervision of Maszovol was concluded in November 1951. Oil was discovered in the Mezökeresztes area, whereupon the government promptly decided on a large-scale exploitation, despite the experts' cautious predictions. Other reports mention "desperate drilling activity to start production," and the "existence of 17 active rigs near Mezökeresztes, which are clearly visible from the trains." The report adds that actual production has not yet started.

A previously discovered gravity maximum at Bugyi, about ten miles south-southeast of Budapest, has been drilled. Mesozoic rocks, without oil or gas shows, were reached at a shallow depth.

Finally, some success but no commercial production has been reported from another drilling operation at Gödöllö, about ten miles northeast of Budapest.

It is apparent that since 1948 very substantial surveying of exploratory activities has taken place in northeastern Hungary, but that up to 1952 no large quantities of oil have been extracted. Fairly large-scale exploration continues, however, in the vicinity of Mezökeresztes, Borsod - Gömor County, and at Mezötur, southeast of Szolnok.

As everywhere else in Hungary, the prospecting is done by the Eötvös Geophysical Institute, while it can be inferred that the actual drilling ("exploitation") has been undertaken by Maszovol since 1948.

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According to an agreement between Hungary and Romania concluded on 17 June 1952, as reported in the official communist press of both countries,[6] Romanian natural gas was to be used by a chemical plant in Hungary. In return Hungarian experts were to build a chemical combinat called ROMACHIM. Hungary was to deliver the equipment for the production of "soda" (Na_2Co_3, Na_2OH, KOH and their derivatives) for the benefit of both countries' economies. A joint Hungarian-Romanian pipe-

#[Cf. cat. 116, p. 73 for source -- Analyst]

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315 [439] line was to be built. The location of the plants and of the projected pipeline was not disclosed.

Subsequently, it has been reported that a pipeline was completed late in 1952 between Oradea, Romania, and Komádi, Hungary, and that construction was proceeding through Körösladány and Mezötúr to Tószeg, south of Szolnok. A branch line to Debrecen was also planned. Although details of this construction project are not yet confirmed it is highly significant that Transylvanian natural gas is being piped to Hungary. It indicates that: No substantial gas discoveries have been made in eastern Hungary during the last few years, and none are hoped for at the present; and that natural gas output has been greatly increased in western Romania, either as the result of the discovery of a gas field in the area south of Oradea or of a spectacular jump in the output of the Transylvanian Basin.

Recent Production

○○○ The preceding sections have presented a comprehensive picture of oil and gas fields and oil and gas occurrences in Hungary, production and reserve data, and exploration activities by the Hungarian government and the various prospecting companies.

One of the main objectives of this study is to provide information about Hungary's production potential under the present communist regime. The secrecy cloaking economic activities in all communist countries hinders the accurate fulfillment of this objective; but it is probable that the estimates given in Table IV are not very far from actual production figures for individual fields.

● 135 315 Before the Iron Curtain closed on Hungary, the following oil fields were known: Lispe; Lovászi; Újfalu; Hahót, with a separate oil occurrence at Söjtör, at the eastern end of the structure, and with a wet gas field at Ederics; and Bükkszék. According to more or less reliable reports, commercial oil occurrences have since been found at: Gellénháza-Nagylengyel; Surd; Tófej; the

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Lake Balaton region (perhaps identical with Nagylengyel); Kiscsehi and Vétyem (extensions of the Lispe field); along the Mátra Mountains, at Mezötúr, and Mezökeresztes. While no reliable or comprehensive production data have been made available for these new discoveries, the estimated 1947-1952 production of all fields is given in Table IV.

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The million-barrel jump from 1950 to 1951 shown in the first World Oil version is highly improbable and was sharply reduced a year later. It could be explained only by the development of a large new field. As it took two years to bring Lispe production to one million barrels, it would appear unlikely that a hypothetical new field could achieve such production in one year, particularly considering the shortage of drilling equipment, and in view of the fact that much of the available equipment was employed drilling new wells in the Lispe and Lovászi fields.

It might be argued, in view of the United Nations figure for 1950 that a million-barrel jump was achieved in two years. It must be emphasized, however, that the U.N. estimates are based on data from official government, namely communist, sources, which are hardly to be relied upon, and conflict with 1950 production figures from all other sources.

Even a 500,000-barrel increase in Hungary's oil production in a year's time would require hard work and exceptionally good luck. There are wells with prolific production (gushers) in several regions of the world, but such wells are very improbable in Hungary considering the geological conditions. If an oil field of the type at Lispe or Lovászi were discovered, and twelve producers were drilled within one year, production in that year would increase by 300,000 barrels, and in the following year, assuming twelve additional producers, by another 600,000 barrels. Meanwhile, production would continue its natural decline in the older fields.

The 1949-1951 production estimates of Table IV† may be too conservative; it is unlikely, however, that production

†[See page 86 -- Analyst]

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Estimated Reserves

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Estimates of initial recoverable reserves are only available for oil fields in operation in Hungary prior to 1948—the Zala fields and Bükkszék. These estimates, in millions of barrels, were 30 for Lispe, 35 for Lovászi, 7.5 for Hahót, and 0.3 for Bükkszék. The Újfalu reserves were negligible. Thus, total initial recoverable reserves were estimated at 72.8 million barrels for these fields.

Total production by the end of 1952, in millions of barrels, was about 21 for Lispe, 30 for Lovászi, 4.3 for Hahót, and 0.1 for Bükkszék, for a total of 55.4 million barrels. This leaves 17.4 million barrels net to be produced from these fields.

Most of this remaining reserve—14 million barrels—is at Lispe and Lovászi. The reckless exploitation of these fields, previously described, has reduced this figure considerably, but expensive new methods resorted to may have restored it again. Thus, if new developments were largely unsuccessful, the low estimate of Hungary's known recoverable reserves could be as low as 17 million barrels.

If, on the other hand, we assume the discovery of one field such as Lovászi, with 35 million barrels of initial recoverable reserves, and of moderate success elsewhere, the high estimate of reserves could be between 55 and 65 million barrels. This would closely correspond to the situation in 1942, when the newly discovered Lovászi field was put into full-scale operation and proved recoverable reserves were slightly over 60 million barrels.

During the last three years communist authorities have claimed strikes more important than Lispe or "richer than the Zala fields" in the Nagylengyel, Lake Balaton, Mezötur, and Mezökeresztes areas, as well as in the former MAORT and MANAT concessions in general. Some of these claims were repeated by escapees, or otherwise found their way into the technical press of Western countries.

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At face value, these claims add up to anywhere between 100 and 250 million barrels of proved reserves, depending on how they are interpreted. However, it must be emphasized that such statements are always vague and unsubstantiated, often contradictory, repetitious, or overlapping, and out of line with constant sharp official reproaches to and condemnations of the oil industry. However, in the light of the Rákosi and Gerö speeches at the close of 1952 the existence of proved reserves of the magnitude of 100 million barrels remains a possibility.

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OIL IN THE CARPATHIAN BASIN

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Tertiary Volcanic Formations

Pre-Tertiary Formations

Nuclei of Granite and Crystalline Rocks

Oil Field and Axis of Structures

Gravity Prospect, Outline of Structures

Oil Occurrence

Gas Well

Dry Hole

Gas Field

Area with Gas Bearing Structures

Boundaries 1914

Boundaries 1947

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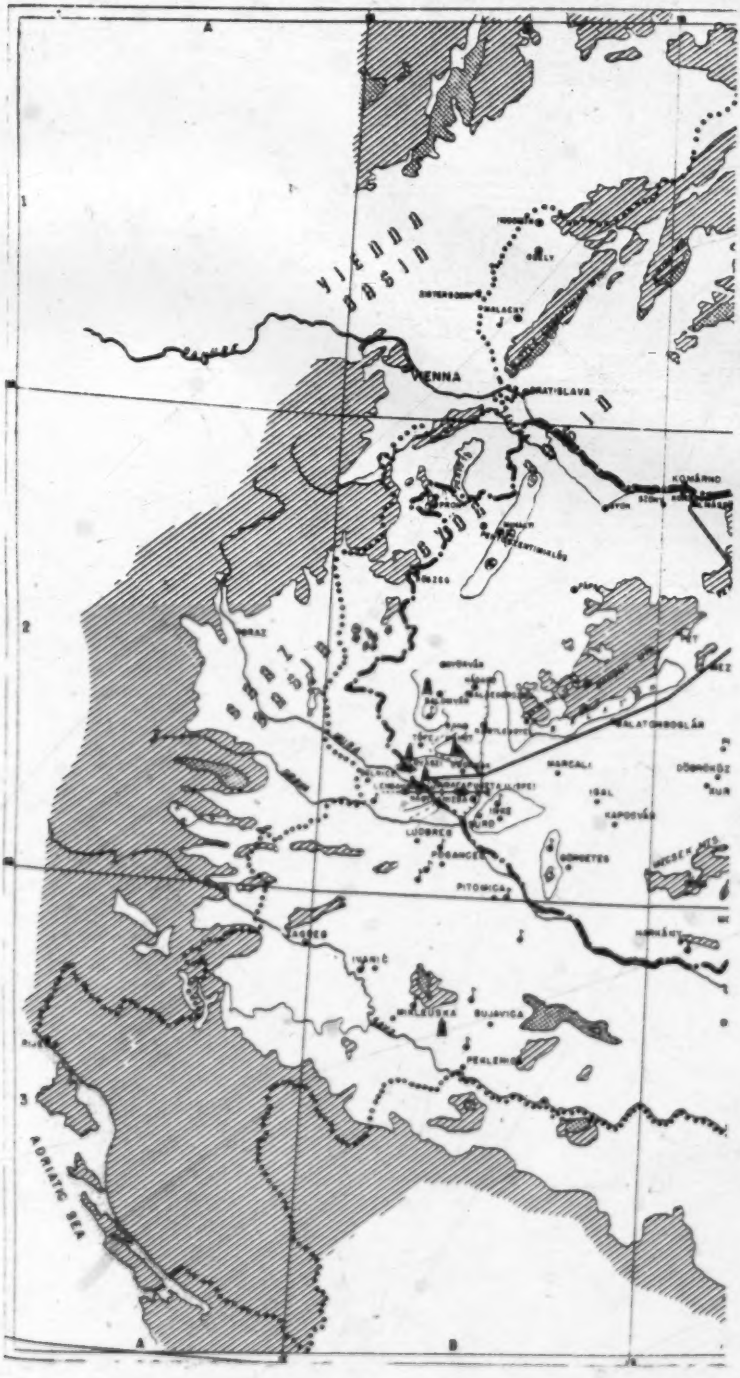
VIENNA
BRATISLAVA
KOMÁRNO
SZOMBATHELY
SZOMBATHELY
SZOMBATHELY

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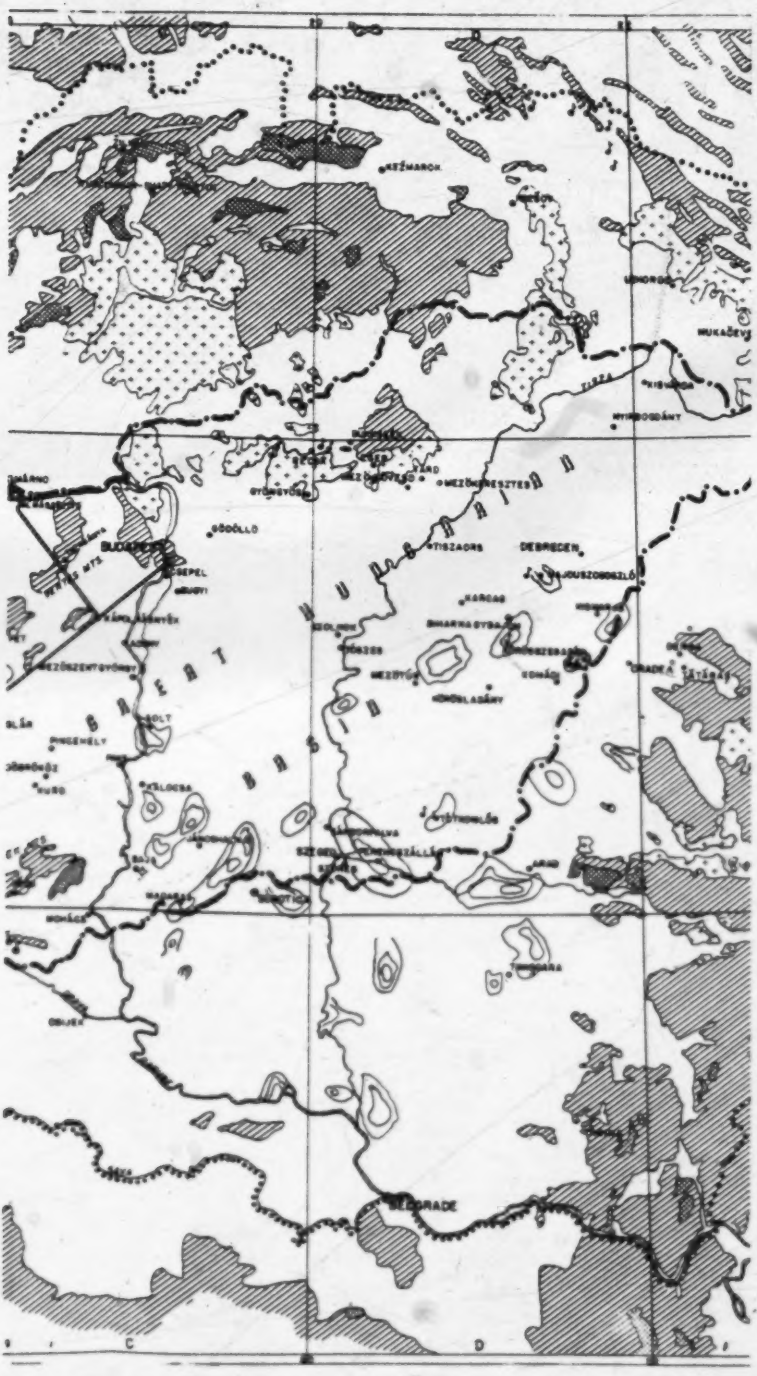

[Facing p. 90(b)]

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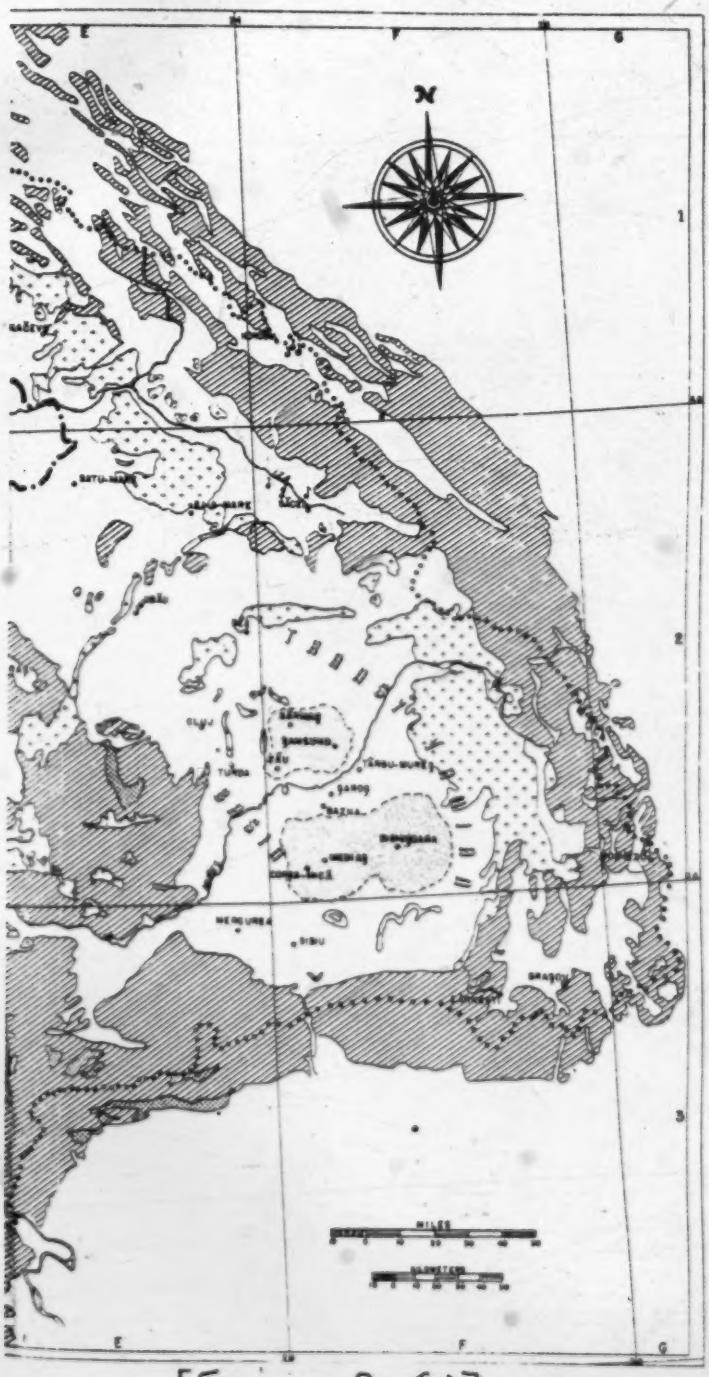

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Abbreviations

Aus.,	Austria
Czech.,	Czechoslovakia
Hung.,	Hungary
It.,	Italy
Rom.,	Romania
Yugos.,	Yugoslavia
mts.,	mountains
riv.,	river

Note

All places are in post-1945 Hungary, unless otherwise designated. Previous Hungarian names are in parentheses.

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APPENDIX

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During the last year the method of exploration was basically changed. With the application of Soviet experience up-to-date seismic (artificial earthquake) exploration was carried out in Hungary for the first time. New treasures of the Hungarian earth were found in many places previously believed to be unimportant. The decline of the old fields, which were so mercilessly "robbed" by American capitalists, was offset primarily by the production of these new areas.

With the introduction of modern methods we were able to stop the alarmingly rapid decline in the production of oil wells. "Secondary" production method were started. These consist of increasing the water or gas pressure in the oil-bearing strata, which then drives the oil to the surface. The American capitalists did not care if this pressure diminished and thereby less oil became available to our people's economy. The socialist oil drilling, however, has already progressed far in eliminating this grave capitalist "inheritance." The help of the Soviet Union had countless aspects. We imported many drilling installations from the Soviet Union and drawing on Soviet experience we began manufacturing our own drilling equipment. We applied Soviet-style fast-drilling and we electrified our oil fields. Our oil experts advanced their knowledge; many of them undertook trips to the Soviet Union and to the people's democracies and had the opportunity to learn a lot from the oil experts of these friendly countries. [648]

It is due to these achievements that—although at the beginning of 1951 our oil production fell seriously behind the targets set in the plan—production greatly increased during the last month of the year and finally the industry as a whole, expressed in the value of the product, fulfilled its plan to 99.8 percent.

What Comrade Gerő [Ernő Gerő at that time Premier Deputy in Charge of Economic Affairs and now Deputy Premier and Minister of Interior] said at the National Production Activa can also be applied to the petroleum industry: "Our results could have been a great deal better if some of our production leaders had not succumbed